Owner's Manual

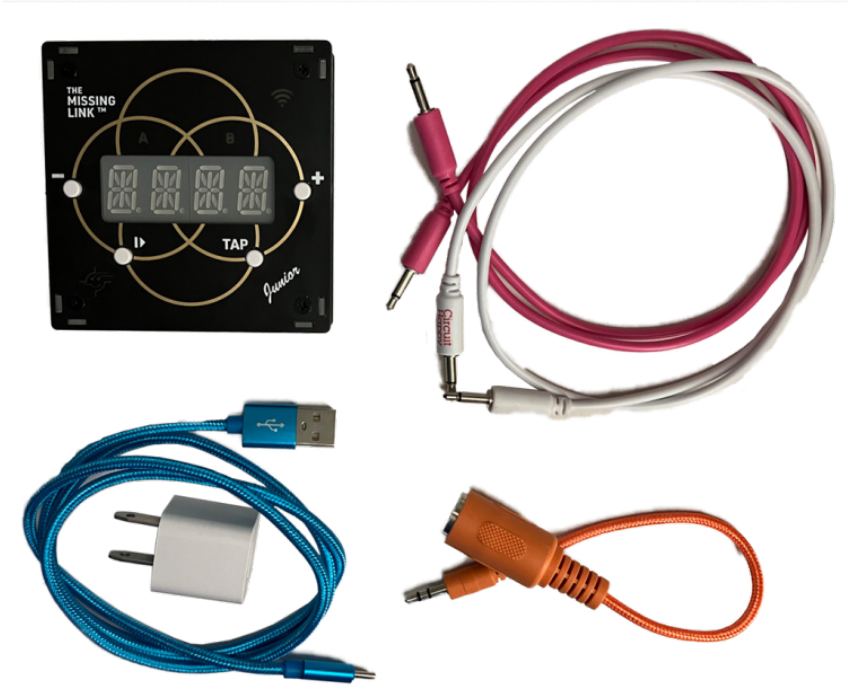
Firmware version 1.5

THE MISSING LINK Junior

Circuit Happy

CONTENTS

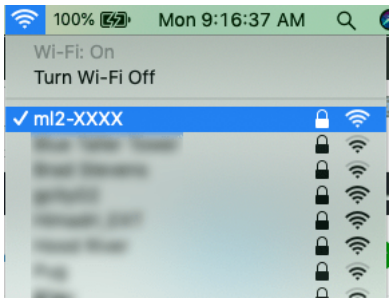
1 Quick Start



Includes two patch cables, a TRS-A MIDI adapter, and USB cable and power supply for either North America, EU, UK, or Australia.

1.1 Powering The Missing Link

1. Plug in the included USB power supply.
2. Connect the included USB cable from the power supply to The Missing Link's USB-C power port.
3. The Missing Link will boot up and status messages will print to the display.



The exact name of the network is included in the Quick Start card and is also affixed to the bottom of Junior's enclosure.

1.2 Connecting To The Missing Link

When The Missing Link boots up, it will automatically go in to **Access Point Mode**. The WiFi light will slowly pulse to indicate this mode.

In Access Point Mode, The Missing Link creates its own WiFi network. Connect your computer or mobile device to this WiFi network. The name of the network is included on the back of the Quick Start card included in the product box.

The network name looks something like this: **MLJR-XXXX**

The default password is: **link1234**

1.3 Configuring The Missing Link with the Editor

The Missing Link hosts a web site for configuring its settings. The URL is based on the same name as used in the Access Point WiFi network.

The URL looks something like this: http://**mljr-xxxx**.local/ (bold text is the same name used in WiFi network)

After the Editor loads, a message should greet you and guide you through the rest of the setup process.

The WiFi light will glow a solid color when it has successfully connected to your local WiFi network. If it failed to connect, it will go back in to Access Point Mode.

If the **mljr-xxxx**.local URL does not work

If you are connected to The Missing Link's WiFi network and you are not able to connect to the ".local" web address then your mobile or desktop computer may not support mDNS. This is required to allow the ".local" address to work.

Try entering this IP address instead: **http://192.168.4.1**

This IP address only works in Access Point Mode. Once The Missing Link is connected to your own WiFi network, a different IP address is assigned by your WiFi router.

1.4 Connect The Missing Link to Your Modules

1.4.1 The A and B Outputs

The Missing Link has two outputs, A and B. The outputs can be configured to generate clock, loop reset trigger, or a high gate while the clock is playing.

The factory default settings for the two outputs are as follows:

- A: 4 PPQN clock
- B: Loop Reset Trigger

Plug Output A in to the Clock/Sync Input on the module you wish to synchronize with The Missing Link. Plug Output B in to the Reset Input, if your module has one.

1.4.2 The TRS MIDI Out Port

The Missing Link Junior has a 3.5mm TRS "Type-A" MIDI Out port for sending MIDI clock signals to your MIDI-capable devices. A TRS to DIN MIDI adapter is included for connecting to 5-pin DIN ports used on the majority of MIDI devices.

1.4.3 The Play Button

Press the Play button on The Missing Link to start generating a clock and reset signals. The MIDI port will send a Start Transport message. The MIDI port sends the 24 PPQN MIDI clock pulse messages at all times, when the clock is stopped or playing. The display will play an animation indicating where The Missing Link is in its loop. Pressing the play button again will stop the output of A and B at the end of the current loop. The MIDI port will send a Stop Transport message at the end of the loop as well.

You may have to change the settings of Output A and B to match the module you wish to synchronize. Click here to learn more about the Output Settings.

2 The Front Panel

The Missing Link interface consists of four buttons, a four-character display, and indicator lights for Outputs, Tempo, and WiFi status.

2.1 A & B Output Indicator Lights

The Output indicator lights show the activity happening on the A and B output jacks.

2.2 Tempo Indicator Light

The Circuit Happy face logo in the lower left corner blinks to the quarter notes of the current Tempo.

2.3 WiFi Indicator Light

The WiFi indicator light communicates the status of the WiFi connection.

- The **light blinks quickly** to indicate it is attempting to connect to a WiFi network.
- The **light is lit a solid color** to indicate it is connected to a WiFi network.
- The **light is slowly pulsing** to indicate it is in Access Point Mode.

2.4 The Buttons

There are four buttons. The primary actions of the buttons from left to right are:

1. **Down** (**–**): Decrease tempo by 1 BPM. Hold the button down to decrease the tempo continuously.
2. **Play**: Start or stop the clock output
3. **Tap**: A single press will display the current tempo. Press the button 2 or more times in succession to set the tempo to the rate at which you pressed the Tap button.

4. **Up** (**+**): Increase tempo by 1 BPM. Hold the button down to increase the tempo continuously.

2.4.1 Hold Tap Button To Enter Menu Mode

Holding the Tap Button for three seconds will cause the screen to start blinking. This indicates that if you release the Tap button, you will enter in to Menu Mode. In Menu Mode you can dive in to deeper settings such as the Output A & B settings and screen brightness. These settings can also be edited via the web-based Editor.

2.4.2 Tap Button as a Shift Button

Holding the Tap button and then pressing the Play, Up, or Down buttons will invoke a secondary function for those buttons. *Note that if the screen starts blinking because you held the Tap button for 3 seconds, you can still press another button to invoke the secondary function. When you release the Tap button you will not go in to Menu Mode.*

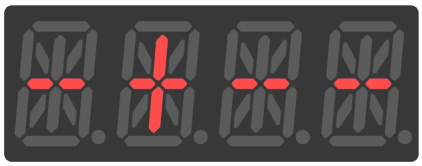
- **Tap & Play**: This function is user-assignable with two available options:
- **Send a reset message at the start of the next loop (Factory Default)** The MIDI port will send a Start Transport message at the start of the next loop. Output A or B, if set to Trigger Reset will send a reset at the start of the next loop, even if it is set to only send a reset on start or stop.
- **Reset the Link timeline grid** to the moment you pressed the Play button. The timeline will re-align to "now", Output A and B will send resets if they are set to Trigger Reset, and the MIDI port will send a Start Transport message. This allows you to re-align the Link grid if you are performing with musicians that are not on the Link grid and you wish to re-align to their downbeat.
- **Tap & Up** button: Increase PPQN to the next option in the PPQN list. The display will briefly display the new PPQN value for both outputs.
- **Tap & Down** button: Decrease the PPQN to the previous PPQN option in the PPQN list. The display will briefly display the new PPQN value for both outputs.

2.5 The Display

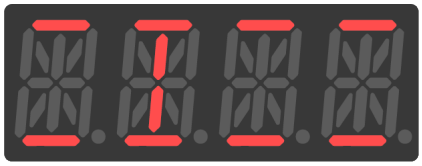
The four-character display has two modes of operation: Playback and Menu. In Playback mode the display shows the current BPM or the current position of the loop. Menu mode is accessed by holding the Tap button down until the display starts blinking. Once the display is blinking, release the Tap button to enter Menu mode. Various settings for The Missing Link can be edited in here.

2.5.1 Playback Mode

If The Missing Link is connected to other Link devices, then the display will animate its loop position within the Ableton Link timeline or grid. There is one animation used when the clock is playing and another that is used when the clock is stopped.



This animation is used when the clock is stopped.



This animation is used when the clock is playing.

If there are no other Link peers on the network The Missing Link will not animate the loop phase when the clock is stopped and will display the current tempo.

2.5.2 Menu Mode

Get ready to go menu diving! Use the four buttons to navigate, select, and move back up a level:

- **Up and Down:** Scroll through the list of menu items. When a setting is being edited, pressing the Up and Down buttons will increase or decrease the value.
- **Play:** Select a menu item. If the item that is selected is a sub-folder, the display will show a new list of items to choose from. If the selected item is a setting to be edited, then the display will show the current setting.
- **Tap:** Move back up a level. Pressing the Tap button at the top level will exit Menu Mode.

3 The Back Panel

3.1 Outputs A & B

The two outputs, A and B, are 5 volt digital outputs that are configurable in a number of ways. See Output and Playback Settings below for more details.

3.2 TRS MIDI Out

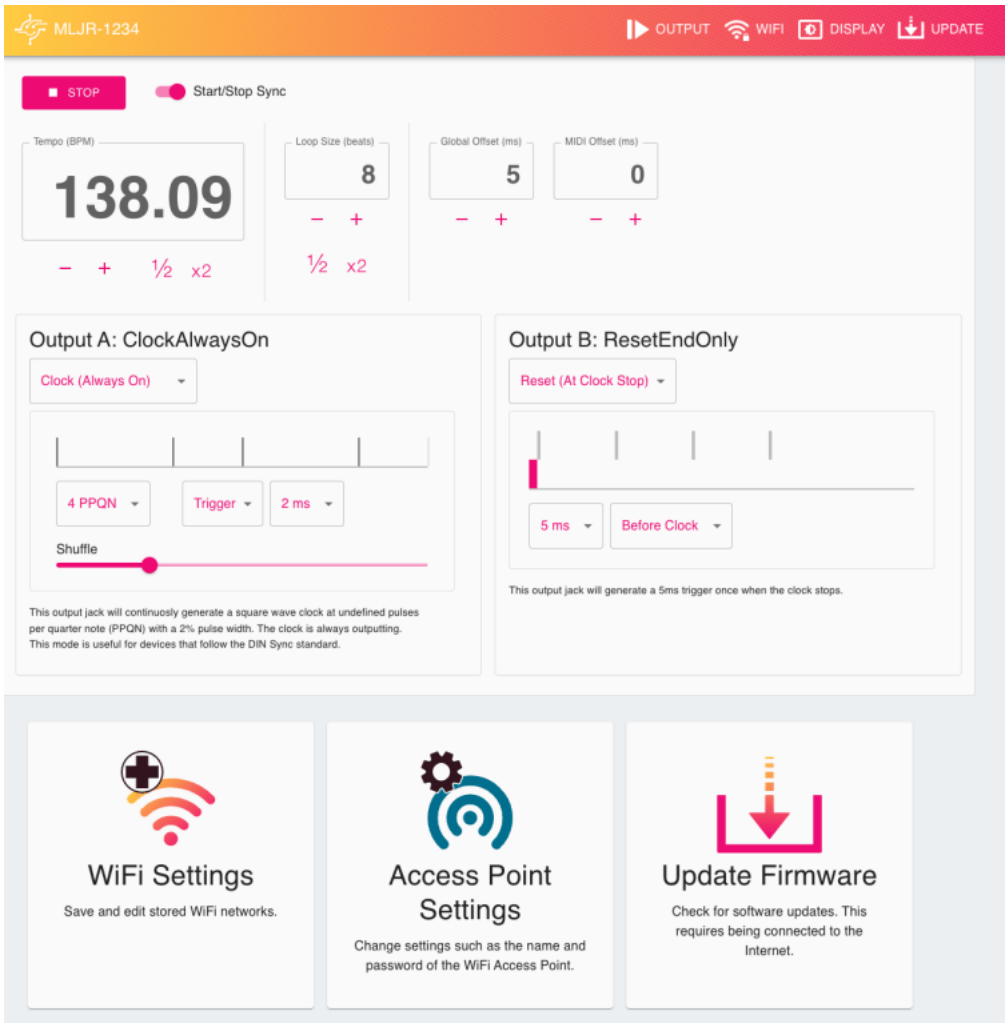
The 3.5 mm TRS MIDI Out port is a Type A standard port. Use the included TRS to DIN adapter to plug a 5-pin DIN cable from The Missing Link to another MIDI device. A TRS cable can be run from The Missing Link's TRS MIDI port to another device that uses the Type A standard TRS MIDI port. If you try to plug a device that uses the Type B standard, the clock will not be received. You will have to use the correct Type A and B TRS to DIN MIDI adapters on each device and use a DIN MIDI cable to connect.

The MIDI port sends MIDI clock signals. It is always outputting 24 PPQN clock pulses messages. When the clock starts playing, a Start Transport message is sent at the start of the first loop. When the clock stops playing, a Stop Transport message is sent at the end of the final loop.

3.3 USB-C Power

The USB-C port is a power-only port. It does not support communication over a serial port. The USB-C port draws about 240 mA of 5 Volt power. A USB A power supply with a USB A-to-C cable is included in the box. The Missing Link will also be fine drawing power from any quality USB power supply, including USB battery packs.

4 The Editor



The Missing Link web-based Editor

The Missing Link hosts a web-based interface to make it easier to edit the various settings within The Missing Link system. In the Editor you will find settings for storing and editing WiFi networks, performing firmware updates, and changing the playback behavior of the A and B outputs.

4.1 Loading the Editor

4.1.1 Connect your computer to the same WiFi network

To load the Editor your web browser must first be on the same network as your Missing Link.

If The Missing Link is in Access Point Mode, then connect your computer or mobile device to The Missing Link's WiFi access point. The default name of the network is the serial number affixed to the bottom of your Missing Link. The serial number also printed

in the quick start booklet included in your product box.

If your The Missing Link is connected to your local WiFi network then connect your computer or mobile device to the same local WiFi network.

4.1.2 Connecting via the ".local" URL

Now that your computer or mobile device is on the same network as your Missing Link, you can access the Editor by opening a web browser and entering the following URL based on your Missing Link serial number:

http://mljr-xxxx.local/

The exact name is included next to your serial number on the quick start card or on the bottom side of The Missing Link case. Also note that there's a trailing "/" at the end of the URL. Some browsers need this forward slash in order to correctly parse the URL.

4.1.3 Connecting via an IP address

If your Windows computer or mobile device does not support Multicast DNS (aka Apple Bonjour) you will not be able to access The Missing Link via its ".local" web address. Apple has a Windows installer for mDNS/Bonjour support. If you cannot install mDNS services then you will have to access your Missing Link via its IP Address.

IP address when in Access Point Mode

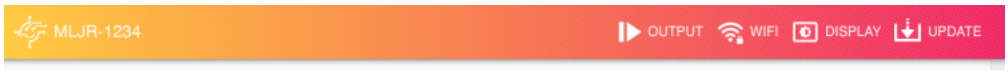
The IP address to access your Missing Link Editor is:

http://192.168.4.1

IP address when connected to your own WiFi network

The IP address is not known when it is connected to your own WiFi network. Generally, the IP address will be dynamically assigned by your WiFi router. If you need to connect via IP address then you should configure your WiFi router to give your Missing Link a dedicated IP address. You should be able to assign a fixed IP address to your Missing Link via the router's administration app or web page.

4.2 The Menu Bar



Click the Menu Icons on the right side of the menu bar to access settings.

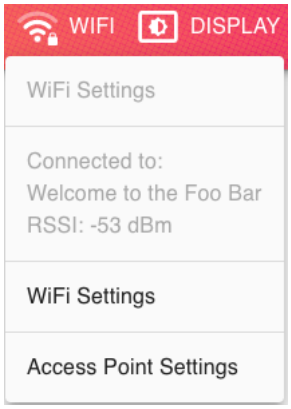
There are several buttons across the top of the web interface for accessing various settings areas. If you access the Editor from a device with a smaller screen, such as your phone, these menu items are accessed via a menu button on the upper left of the screen.

On a mobile device, access the Settings Menu by clicking the three-lined "hamburger" icon on the left.

4.2.1 Output

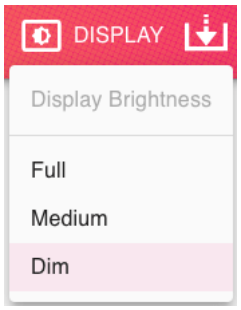
Click the Output button to bring you to the "home" page where the Output Settings live.

4.2.2 WIFI



Click the WiFi button to open the WiFi menu. In the WiFi menu you will see information about your WiFi connection as well as a links to the WiFi Settings and Access Point Settings pages.

4.2.3 Display

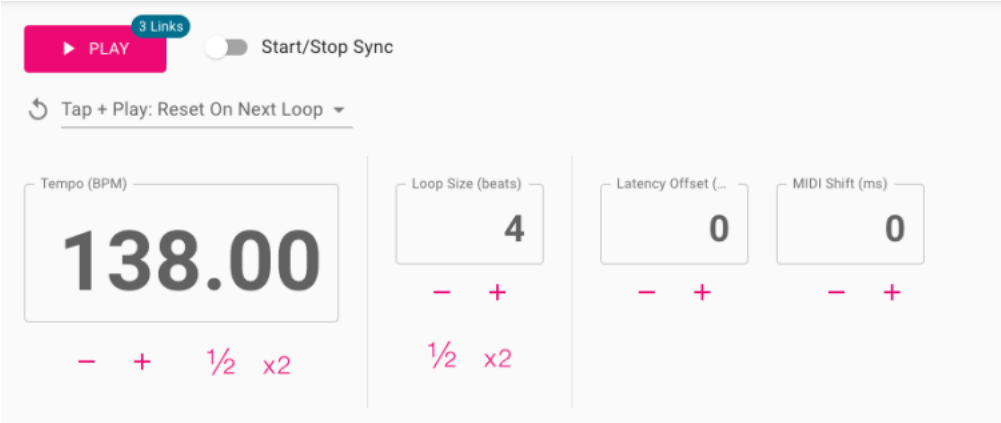


Click the Display button to show the display brightness setting. This will dim the 4-character display as well as the tempo and WiFi indicator LEDs. The A & B indicators are not dimmable.

4.2.4 Update

Click the Update button to see the currently installed firmware version as well as a link to the Firmware Update page. If there is an available update a flag will appear next to the Update icon indicating the new firmware version number.

5 Playback Settings



5.2.1 Playback Settings

At the top of the main Editor page, just below the menu bar, are the Playback Settings. This includes a Play/Stop button, Start/Stop Sync switch, Tempo, Loop Size, and Offset controls.

Start/Stop Sync

When this feature is enabled The Missing Link will listen for Start/Stop transport messages from any other Link 3.0 peers with Sync Start/Stop enabled. If any of the devices start playing or stop playing the other devices will also start or stop playing.

This is an Ableton Link 3.0 feature. Your other Link apps or devices may not support Link 3.0 and thus, may not work with this feature.

Tempo (BPM)

The tempo controls how fast everything plays. Tempo is set in Beats Per Minute. Changing this value will also change the Tempo of any other Link devices you are networked with.

You may either enter a new tempo via the text input box or use the **+** or **–** buttons to increase or decrease the tempo. There are also **1/2** and **x2** buttons to double or half the tempo.

Loop Size (beats)

This feature sets how often a Loop Reset output triggers. It also controls quantization of the Play/Stop control. The value of Loop Size is in beats (quarter notes). Setting Loop Size to a value of "4" will cause a Loop Reset Trigger to happen every bar in a 4/4 time signature.

You may either enter a new Loop Size via the text input box or use the **+** or **–** buttons to increase or decrease the Loop Size, one beat at a time. There are also **1/2** and **x2** buttons to double or half the Loop Size.

Delay Compensation (ms)

When using the Rhythm Explorer CV clock mode this loop size also sets the loop size of that CV clock's output.

Devices on an Ableton Link peer network can be time-shifted ahead or behind other Link peers. Sometimes the device you are synchronizing might have its own built-in latency that causes it to play a little bit behind the Link grid. In either case, you can use this setting to shift your clock output in time to better align with the Link music grid. Enter a value in the text input box or use the **+** or **–** buttons to increase or decrease the Delay Compensation. This value is in Milliseconds.

MIDI Nudge (ms)

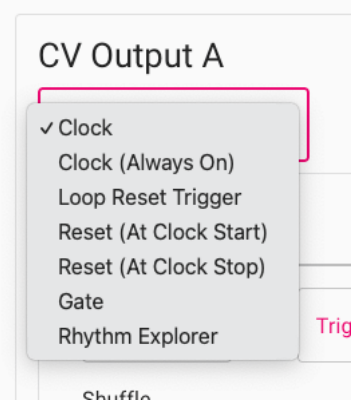
MIDI devices have their own internal latency when responding to MIDI messages. A little delay here will nudge your MIDI devices in to alignment with the devices being sync'd via Output A or B. This setting has a range of -10 to +100 ms.

6 Output Settings

6.1 CV Clock Settings

The Missing Link has two CV clock outputs: A and B. These outputs can be configured independently. By default, the A output will play a 4 PPQN clock trigger whenever the clock is playing. When the clock is stopped, Output A will output nothing. Output B will output a single trigger at the start of each loop when the clock is playing. When the clock is stopped, Output B will do nothing.

6.1.1 CV Clock Output Modes



Clock

The chosen output will generate a clock signal whenever The Missing Link is playing. When it is stopped, the output will not create a signal.

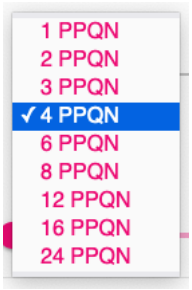
Clock (Always On)

The output will always output a clock signal, no matter the playback status. This mode is useful for any devices that require a DIN Sync style clock. It is usually paired with a second output in Gate mode.

Common Clock Settings

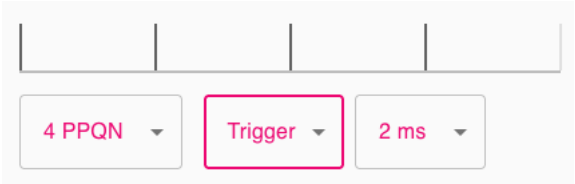
Whether you have chosen "Clock" or "Clock (Always On)" there are several options to set up the clock to your sequencer's requirements.

PPQN



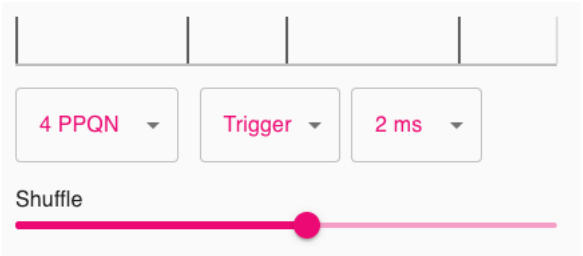
PPQN, or Pulses Per Quarter Note, indicates how many clock pulses to create per quarter note of time. Refer to the manual for the device you are syncing with The Missing Link to find out what PPQN value that device is expecting.

Trigger



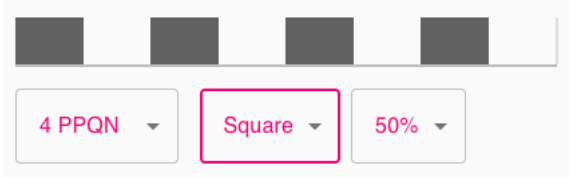
Clock signal will consist of equal length triggers which can be 2, 5, or 10 milliseconds long.

Shuffle



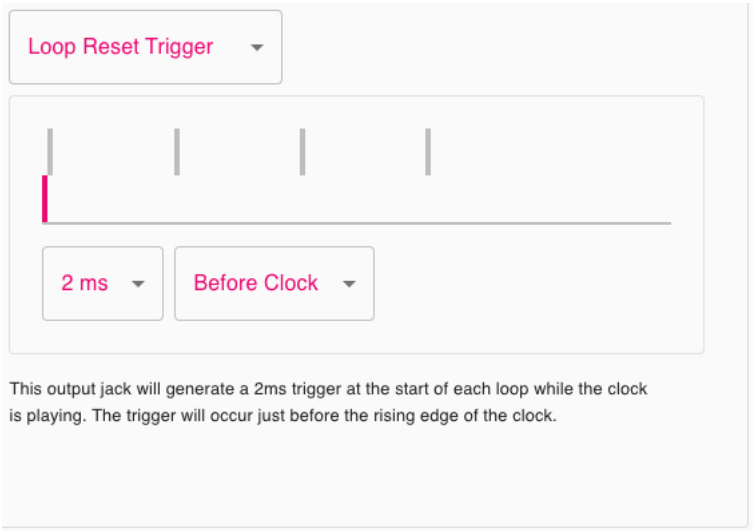
Increasing shuffle will cause the clock triggers to cluster together to add some funky groove to your sequencer. The clock visualization will give you a preview of the shuffled clock triggers. Shuffle is disabled at 24 PPQN. It is also disabled in Square wave clock mode.

Square



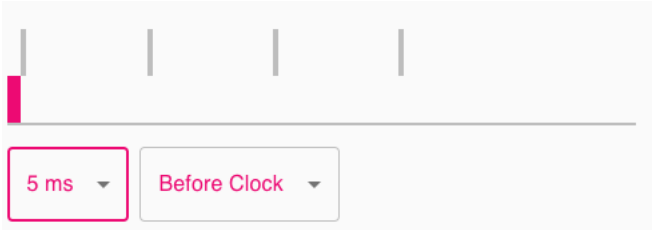
Clock signal will be a square wave signal with a 10, 25, 50, or 75% pulse width.

Reset Trigger / Reset (At Clock Start) / Reset (At Clock Stop)



Reset Trigger will generate a trigger at the start of each loop while the clock is Playing. **Reset (At Clock Start)** only generates a trigger at the start of the first loop when the clock starts playing. **Reset (At Clock Stop)** only generates a trigger at the end of the final loop when the clock is stopped. Reset Triggers do not output when the clock is Stopped. The trigger can be set to a length of 2, 5, or 10 milliseconds.

Alignment to Clock Edge

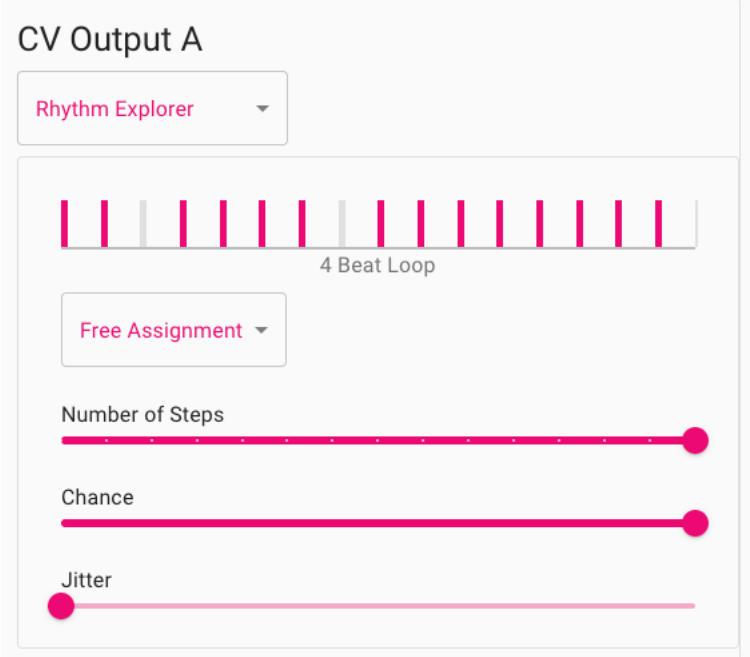


The Reset Trigger can either output in alignment with the clock edge or just before the clock edge of the first first clock of a loop.

Gate

The output will turn on (i.e. go high) when The Missing Link is playing. When The Missing Link is stopped, the output will turn off (i.e. go low). This acts as a switch to turn on, or gate, another device whenever The Missing Link is playing. It can be paired with another output set to **Clock (Always Running)** to create DIN Sync-style clocking.

New! Rhythm Explorer

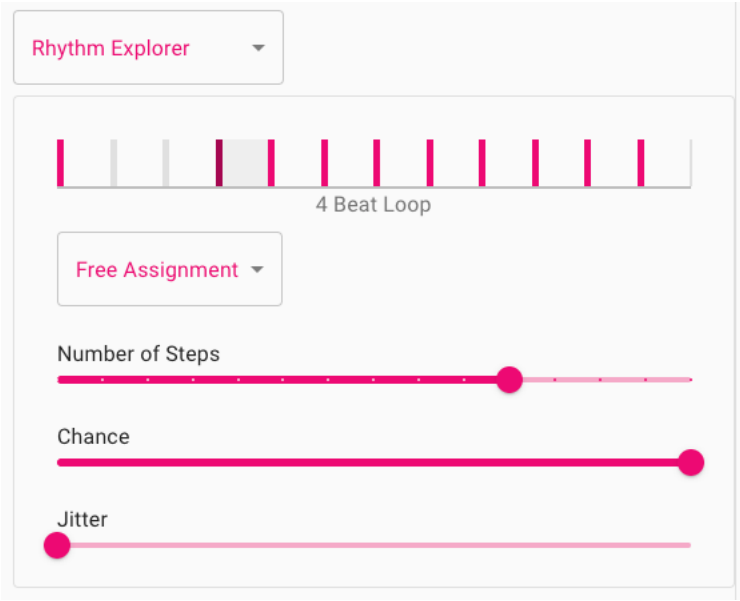


Rhythm explorer mode allows you to disrupt your clocks with some maths and chaos, providing new rhythms into your music instantly. Instead of a regular steady clock, turn on Rhythm Explorer mode to introduce looping patterns as your clock with the ability to choose the number of Steps, Pulses and introduce Chance and Jitter! Rhythm Explorer was inspired by conversations I had with MATTHS. Matt was impressed with the stable clock and Ableton Link integration of The Missing Link but wished to "break" the clock in creative ways so his sequencers wouldn't clock in regular patterns and thus generate all kinds of happy accidents along the way. We hope you enjoy Rhythm Explorer!

Loop Size

Rhythm Explorer works a bit differently than the other clock modes. The clock pulses in Rhythm Explorer are spread across the Loop Size set in the Playback Settings above. So if you set Rhythm Explorer to 16 steps and Loop Size is set to 4 beats, then there will be 16 steps distributed across those 4 beats (4 clock pulses per beat). If you then changed the Loop Size to 2 beats, the clock output would be spread across 2 beats, similar to clock multiplying by 2 (8 clock pulses per beat). If you changed the Loop Size to 16 beats, then there would be 1 clock pulse per beat.

Rhythm Mode: Free Assignment



Click on a step in the graph to enable or disable it. Disabled steps are a light gray color.

Number of Steps

The number of clock pulses spread across the Loop Size set in Playback Settings.

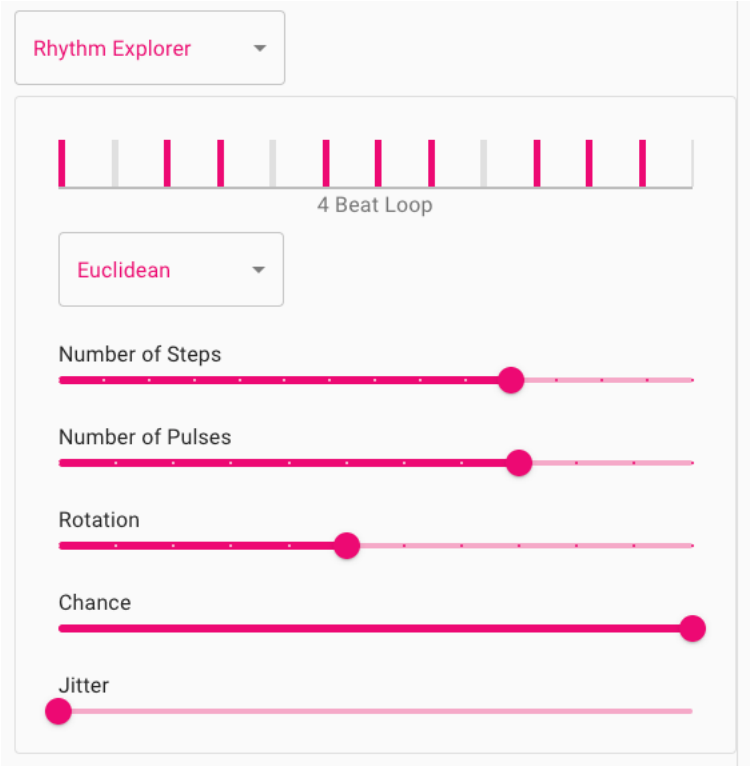
Chance

The percent chance that an enabled clock pulse will output. When this is set to 100% any enabled clock pulse will always output. Set to a lower amount and each time an enabled step is set to output virtual dice are thrown to see if that step will indeed output. Disabled steps are always disabled.

Jitter

Add random variation to the clock pulse output. Instead of outputting accurately, the clock pulses will fluctuate to arrive early or late causing the clocked device to slowdown and speed up over time. Lower settings have subtle effects similar to a shuffled beat and higher settings are chaotic.

Rhythm Mode: Euclidean



Define which clock pulses are enabled and disabled based on Euclidean Rhythm math.

Number of Steps

The number of potential clock pulses spread across the Loop Size set in Playback Settings.

Number of Pulses

The number of clock pulses to enable distributed across the Number of Steps. The algorithm will try to distribute those pulses as evenly as possible across the Number of Steps.

Rotation

Push the clock pulse pattern starting point across the Number of Steps. The clock pulse pattern wraps around to the beginning of the loop if it falls off the end of the loop.

Chance

The percent chance that an enabled clock pulse will output. When this is set to 100% any enabled clock pulse will always output. Set to a lower amount and each time an enabled step is set to output virtual dice are thrown to see if that step will indeed output. Disabled steps are always disabled.

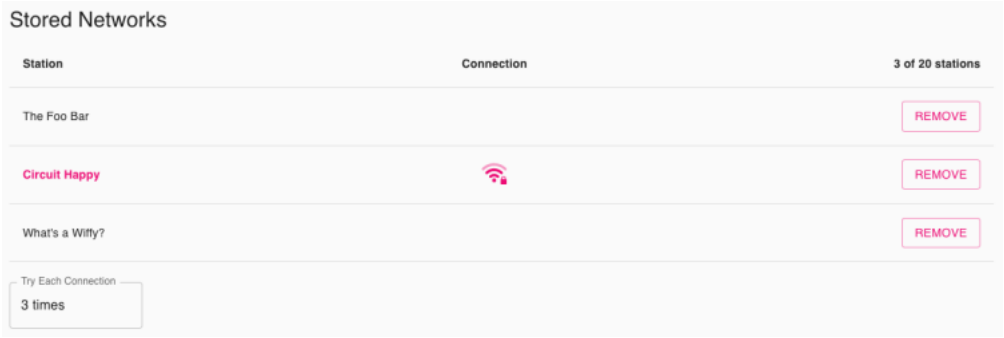
Jitter

Add random variation to the clock pulse output. Instead of outputting accurately, the clock pulses will fluctuate to arrive early or late causing the clocked device to slowdown and speed up over time. Lower settings have subtle effects similar to a shuffled beat and higher settings are chaotic.

7 WiFi Settings

WiFi Settings is where you store and edit stored WiFi networks. At the top is a list of stored WiFi networks.

7.1.1 Stored Networks



The network in which you are connected will be in bolded pink text. Click the Remove button to remove a stored WiFi network. A dialog will appear confirming the removal of the network. After clicking Yes, another dialog will ask you if you wish to refresh your system. This will reboot your Missing Link.

The small box labeled "Try Each Connection" indicates the number of connection attempts The Missing Link will make before moving on to the next stored WiFi network.

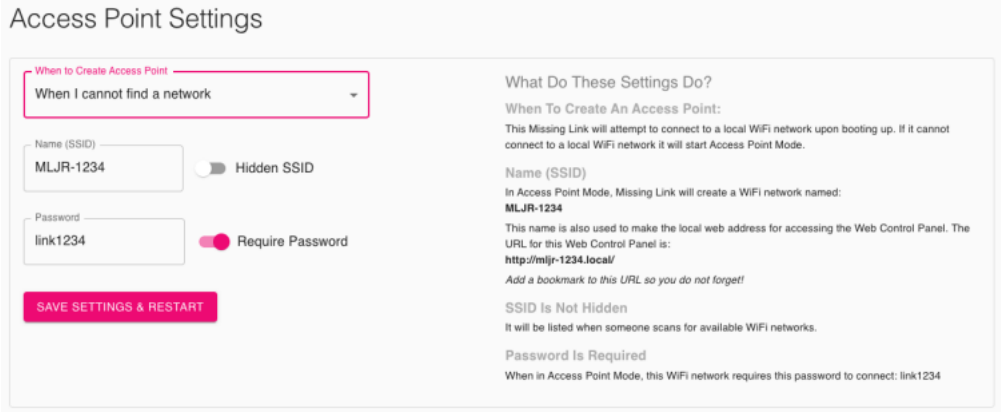
7.1.2 Add New Network

This section displays a list of currently available WiFi networks that your Missing Link has found. Click on a network and a dialog will ask you to enter a password. If your network is an open network (no password needed) leave the password field blank.

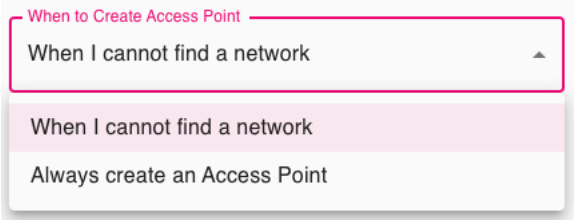
If the network you wish to connect to is a hidden network click the "Manually Add Network" button to enter both the name of the network (SSID) and the password to the network.

8 Access Point Settings

Your Missing Link has the ability to both connect to other existing WiFi networks or create its own network. When The Missing Link is making its own WiFi network it is in Access Point Mode. Any other Link devices can join this network to synchronize with The Missing Link. The Access Point Settings page allows you to adjust the Access Point to your liking.



When to Create Access Point



When I Cannot Find A Network

Your Missing Link will attempt to connect to any of the WiFi networks you have stored in its memory. If The Missing Link cannot connect to one of these WiFi networks then it will start its own WiFi access point, using the settings described below. You can then connect to The Missing Link's WiFi network in order to communicate over Ableton Link or to connect to the Editor.

Always Create An Access Point

Your Missing Link will not attempt to connect to any of your stored WiFi networks. It will immediately create its own WiFi access point, using the settings described below.

Name (SSID)

This is the name of the WiFi network The Missing Link will create when in Access Point Mode. The name is also used in the web address of your Editor. If you change the Name to "MyLink" then the web address to access the Editor would be http://mylink.local/

Hidden SSID

Enabling this will stop your Missing Link's WiFi network name from being listed in the WiFi menu of computers or mobile devices. This allows your WiFi network to be a little less discoverable in a situation such as live performance. You do not want people trying to connect to your Missing Link's WiFi network whilst you are performing!

Password

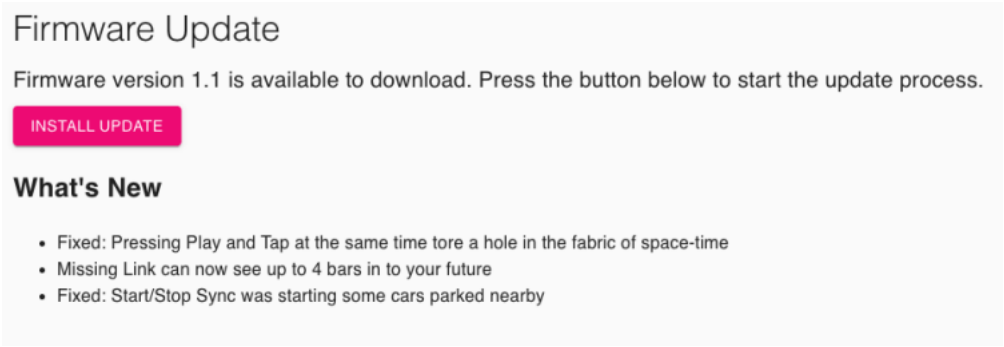
This is the password needed to gain access to your Missing Link's WiFi network.

Require Password

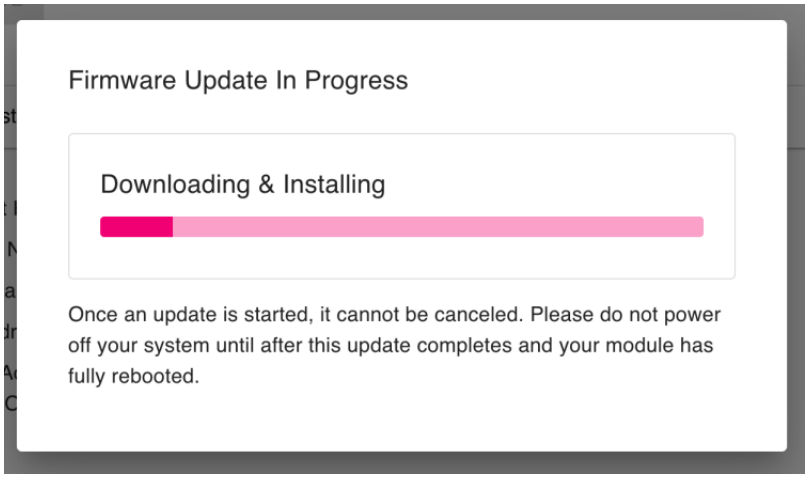
Disable this if you wish to have an open network that anyone can easily join. This is nice for Link jams where you want to make it easy for others to join in the fun.

9 Updating Firmware

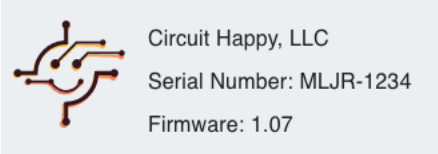
Upon entering the Update Firmware page, The Missing Link will automatically ping the Circuit Happy server to check for an available update. If one is available, a button will appear that reads INSTALL UPDATE. Click it to start the update download and install process.



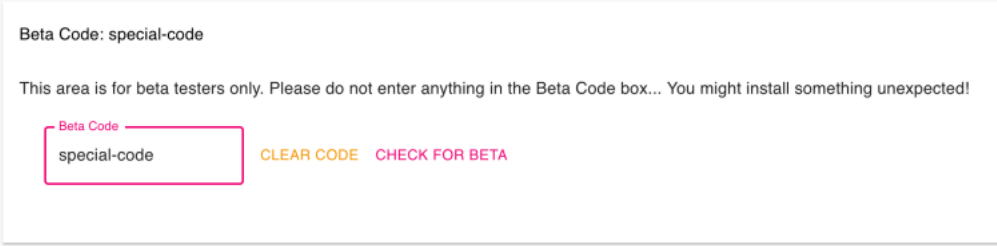
A window will pop up showing the installation progress.



After the install successfully finishes, The Missing Link will automatically refresh the system and the Editor will reload when The Missing Link is back online. You can verify that the new firmware version installed successfully by checking the firmware version listed at the bottom of every page of the Editor:



Beta Codes



At the bottom of the Firmware Update page, there is a "Beta Code" area. If you are a beta tester you would enter a secret beta code here to install a beta firmware. Unless you are participating in a beta testing program, please leave the Beta Code box empty.

10 I can't connect to the Editor

Networking can be very tricky. Here are some suggestions if you are having problems connecting to your Missing Link Editor.

Make sure that your computer is connected to the exact same WiFi network as your Missing Link. If your computer is connected to the WiFi network with "My Network 5G" at the end but The Missing Link is connected to "My Network" (without "5G" at the end), they may not be able to see each other correctly.

2.4 GHz vs 5 GHz WiFi

The Missing Link can only communicate on a 2.4 GHz WiFi antenna. If your WiFi router has combined both the 5 GHz and 2.4 GHz networks under one name (this is quite common) it is possible your computer or other devices are connected to the 5 GHz network and your Missing Link will be connected to the 2.4 GHz network. These two combined networks may not be able to send Link between them. It is best to name your 2.4 GHz network differently from your 5 GHz network. This way you can be assured that all the devices you wish to Link together are on the 2.4 GHz network.

Be sure there's a trailing slash in the URL: **http://mljr-xxxx.local/**

If that doesn't work try dropping the .local from the URL: **http://mljr-xxxx/**

When you are connected to your Missing Link via its Access Point Mode you can use this IP address to access the Editor: **http://192.168.4.1**

When your Missing Link is connected to your own WiFi network, then the IP address is usually dynamically assigned by your WiFi router. You should be able to find the IP address of your Missing Link via the administration panel of your WiFi router. You should be able to set up your router to assign your Missing Link a fixed IP address. You can then bookmark this IP address in your web browser.

More detailed WiFi and Link troubleshooting can be found in my Link Troubleshooting knowledgebase article.

11 How to Perform a Factory Reset

In the off-hand case that your Missing Link gets confused or lost from your network with nary a breadcrumb to find your way back to it, you can apply a factory reset to revert your Missing Link back to the state it was in when you first took it out of its colorful box for the first time.

1. Power off your Missing Link.
2. Press and hold the Up (+) and Down (-) buttons.
3. While continuing to hold those two buttons down, power on your Missing Link.
4. Keep holding the two buttons until the display reads "FACTORY RESET". Now you can release the Up and Down buttons. *Note: if you decide at this moment that you do not wish to continue with the factory reset, stop and do nothing. Wait a few seconds and the reset will time out and boot up normally. If you do wish to reset The Missing Link, continue on to step 5 before that timeout period ends.*
5. Press the **Play** button four times to initiate the factory reset.
6. The display will read "DONE" when the reset is complete. The Missing Link will then reboot with factory settings and firmware.
7. The Missing Link should be in Access Point Mode upon booting. The name of the Access Point will be displayed on the screen. It should be the same as the serial number printed on the bottom of The Missing Link's case.

If you run in to any issues, don't hesitate to Contact Us!

12 Credits

First of all, I want to thank my incredible wife, Christina, for supporting me throughout this whole Circuit Happy adventure! Circuit Happy would not exist without her.

Thank you to:

- Nick Donaldson, aka Infrasonic Audio, for starting this project with me seven years ago, and then more recently joining back up as a consultant rebuilding the firmware for Junior from scratch.
- Matthew Campbell for his guidance on the hardware design as well as his insights on RTOS architecture.
- Matthew Hodson aka MATTHS for his efforts in helping spread the word about Circuit Happy and also his insights in to new product features including Rhythm Mode.
- Captio Labs for their work building me an ace program and test harness to ensure each Junior is a qualty dvice.
- Neil Kolban's incredible gift of ESP32 knowledge deposited on GitHub. Much of ESP32-snippets was referenced to find my way during the development of Junior and ML:2.
- My intrepid beta team: Damien O'Reilly, Chris Ward, Nick Donaldson, Joshua Lim, and Martin Tef.
- Our three human Juniors.